Abstract Submitted
for the DFD08 Meeting of
The American Physical Society

Active Flow Control on Low-Aspect Ratio, Low-Reynolds Number Airfoils[1] MATTHEW MUNSON, DAEGYOUM KIM, WILLIAM DICKSON, MORTEZA GHARIB, California Institute of Technology — Insect flight observations show high-lift mechanisms that rely on leading-edge vortex stabilization. These processes are intimately coupled to the flapping motion of the insect wing. In fixed wing applications, suitable for micro-air vehicles, active flow control may be capable of providing similar influence over vortex formation and stabilization. Steady and pulsed mass injection strategies are used to explore the open-loop response of both the evolution of the flow structures and the forces experienced by the wing. Flow structures will be quantitatively visualized using Defocused Digital Particle Image Velocimetry (DDPIV) and forces measured via a six-axis balance. Insect flight typically occurs at Reynolds numbers of 10^2 to 10^4, and aspect ratios near three. For this investigation, Reynolds numbers are approximately 10^3. The airfoil models are NACA 0012 profiles with aspect ratio two.

[1]Work supported by a Multidisciplinary Research Initiative from the United States Air Force Office of Scientific Research (FA9550-05-1-0369). Student support through the National Defense Science and Engineering Grant is acknowledged.

Matthew Munson
California Institute of Technology

Date submitted: 04 Aug 2008 Electronic form version 1.4